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this report follow the CNDDDB occurrence reporting standard of at least one-quarter of a mile separation between stands or colonies of a prioritized species. Surveys, inventories, and plant identification were conducted by DWR staff botanists (Attachment 2). Field survey activities were documented throughout the two year study, including dates, location, authorized property access, and assigned personnel (Attachment 3).

Annual precipitation totals, which significantly influence annual plant species germination, were noted for the 1998 and 1999 water years (Table 1.2.6.).

Table 1.2.6. Total Precipitation and Percent of Average for Water Year 1998 and 1999 in Red Bluff, Orland, and East Park Reservoir, California.

STATION	WATER YEAR ¹	
	Total Precipitation (inches) / Percent of Annual Average	
	October 1997-September 1998	October 1998-May 1999
Red Bluff (Red Bank)	21.51 / 213	17.02 / 83
Orland (Newville)	20.36 / 232	15.93 / 82
East Park Reservoir (Sites/Colusa cell)	18.98 / 232	16.46 / 90

Notes:¹ California Department of Water Resources, Division of Flood Management, 1999.

2. RESULTS

2.1. General Vegetation: Summary of Findings

The following natural communities and vegetation types occur within the reservoir sites. These classifications or series are based on the dominant vegetation of a given area. These series are recognized in the literature as occurring in portions of the inner North Coast Range and Central Valley of California including Glenn, Colusa, and Tehama counties (Keeler-Wolf 1995).

Grassland

California annual (includes vernal pools and swales)

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This upland plant community of herbaceous annual grasses and herbs is characteristically composed of many non-native and native species. Species composition is highly variable among stands and throughout the growing season. Vernal pools and swales, within the annual grassland, support unique assemblages of native annuals. Annual grassland occurs at all the reservoir alternatives. Red Bank reservoir is the only site that did not have vernal pools.

nodding needlegrass (Nassella cernua)

This upland series is dominated by herbaceous plants with nodding needlegrass the sole or dominant grass in the ground layer. Other native and non-native perennial grasses and emergent shrubs and trees are present but the grass layer is less than 1 meter tall. Numerous small stands (less than 5 square meters) were observed on clay soil in blue oak woodland in all reservoirs although these were not large enough to be mapped from the aerial photographs.

purple needlegrass (Nassella pulchra)

Purple needlegrass, a perennial bunchgrass, is the sole or dominant grass in this upland series which may include other native or non-native perennial and annual grasses less than 1 meter tall. It was observed in all of the reservoir sites on clay soils, generally in openings in blue oak woodland, in small unmapped units.

Chaparral

chamise (Adenostoma fasciculatum)

Chamise is the sole or dominant shrub (greater than 60 percent) in continuous upland canopy in this series. Emergent trees may be

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present but native shrubs such as poison oak and manzanita form a mosaic with the chamise and the ground layer is sparse.

Chamise chaparral was found on the western edges of the Red Bank and Newville sites.

wedgeleaf ceanothus (Ceanothus cuneatus)

Wedgeleaf ceanothus is the dominant canopy in this upland woody series. Other native shrub species form a mosaic with *Ceanothus* which can form a continuous or intermittent canopy with a very sparsely vegetated ground layer. This series occurs sporadically in the Red Bank, Newville, and Sites reservoirs.

Riparian

Riparian vegetation is associated with intermittently or seasonally flooded or saturated intermittent drainages, stream corridors or floodplain terraces. Dominant stands of Fremont's cottonwood (*Populus fremontii*), mixed willow (*Salix spp.*), and narrowleaf willow (*Salix exigua*) series were observed in the reservoir sites. Mexican elderberry (*Sambucus mexicanus*) series occurs in stands which were not large enough to be mapped as distinct vegetation units.

Woodland

Valley oak (*Quercus lobata*)

Valley oak woodland is the sole or dominant tree in a continuous, intermittent, or open canopy which may include other native tree and shrub species. Associated with intermittently flooded or seasonally saturated wetlands and uplands, openings are characteristically grassy. This series occurs along the major tributaries in the reservoir sites.

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Blue oak (Quercus douglasii)

Blue oak is the sole or dominant tree in this woody upland series. Canopy density may be variable and the understory may include shrubs and a grassy ground layer. This series occurs in the reservoir sites in the valleys, on slopes, and in moderately rocky to well-drained areas.

Mixed oak (Quercus spp.)

Several species of oak may be present in this upland woody series, including blue oak (*Q. douglasii*), interior live oak (*Q. wislizenii*), and/or valley oak (*Q. lobata*). Other native tree species including foothill pine (*Pinus sabiniana*) may be present in addition to native shrubs and a grassy ground layer. This series occurs in the Red Bank and Newville reservoir sites.

Foothill Pine (Pinus sabiniana)

Foothill pine is the sole or dominant canopy species, or may be an emergent tree over a continuous to intermittent shrub canopy. Other native tree and shrub species may also form a mosaic with a grassy to sparse ground layer. This series may occur in intermittent freshwater wetlands and rocky to well-drained uplands. This is the dominant vegetation community at the Red Bank site. Foothill pine community does not occur in the Sites, Colusa cell, or Newville reservoir areas.

Ruderal

This category refers to weedy or disturbed conditions including areas surrounding residences, out-buildings, and stockyards. These areas may also include non-native, ornamental varieties of

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plants.

Cultivated grains/crop

Orchards, grain crops, and vineyards were observed in all the reservoirs. These include cultivar varieties of non-native plants.

Wetlands

Spikerush (*Eleocharis* sp.), and vernal pools are discussed here as mapped vegetated wetland series. Spikerush wetland was observed in the Sites, Colusa cell, and Newville sites. Vernal pools occur in all the reservoirs except Red Bank. Other wetlands and water, which occur in the reservoirs, but are not discussed here, include intermittent drainages, streams, and ponds.

Acreage estimates of mapped vegetation types were calculated in each reservoir (Table 2.1.; Figure 2.2).

Table 2.1. Acreage Estimates for the Dominant Vegetation Communities Mapped Within the Offstream Storage Reservoir Alternatives, 1999.

Vegetation ¹	Acreage By Reservoir				
	Sites	Colusa Cell	Colusa Reservoir ²	Thomes/Newville	Red Bank
Grassland	12,602	13,540	26,142	14,492	565
Woodland (oak)	923	20	943	1,839	899
Woodland (foothill pine)	0	0	0	0	2826
Chaparral	5	0	5	363	98
Riparian	52	37	89	64	73
Vegetated wetland	23	15	38	0	1
Cultivated grain	277	0	277	0	0
Vegetation Subtotal	13,882	13,612	27,494	16,758	4,462
Other	280	51	331	315	142
Total reservoir acreage	14,162	13,663	27,825	17,073	4,604

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Notes: ¹ Other classification refers to disturbed/developed acreage within the inundation elevations.
² Colusa Reservoir is a northward extension of the Sites reservoir which expands to include the Colusa cell acreage.

2.2. Sensitive Plants: Summary of Findings

There were no high priority plant species found in the Offstream Storage Reservoir alternatives during 1998-1999 field surveys. Six priority and 8 low priority species were found within the project inundation areas, with a collective total of 143 populations (Table 2.2.1).

2.2.1. Sites and Colusa Cell Reservoirs There were no high priority or priority species found in the Sites or Colusa cell alternatives. Ten total occurrences of four low priority plant species were identified at Sites reservoir compared with six total occurrences of the same four species in Colusa cell (Table 2.2.1.). Thirty percent of the species identified from Sites are non-native, compared to 27 percent in Colusa cell (Table 2.2.2). Although only approximately one-third of all the species identified for these sites are non-native, qualitatively these non-natives make up the dominant vegetative cover in the annual grassland.

2.2.2. Newville Reservoir Thirty-one total occurrences of 4 low priority species and 23 total occurrences of 5 priority species were identified in the Newville reservoir (Table 2.2.1.). North and south-facing shale slopes and heavy clay deposits are associated with several prioritized species in this reservoir. In comparison with Sites and the Colusa cell reservoir sites, only 24 percent of the Newville species are non-native, however; they constitute the dominant cover at this site also. Newville has the greatest vascular plant diversity and the greatest number of plant families (85), genera (259), and species (522) represented (Table 2.2.2.).

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Red Bank Reservoir Ten prioritized plant species and 73 total populations were found in this location; 39 priority species populations and 34 populations of low priority species (Table 2.2.1.). Although 21 percent of all species identified in Red Bank are non-native, at this site non-natives are not the dominant vegetation relative to cover. Native woodland species constitute the dominant vegetative cover (78 percent) at this site (Table 2.1.).

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Table 2.2.1. Summary of Prioritized Plant Species found in the Offstream Storage Reservoir project, 1998-1999.

Reservoir	Common Name (scientific name) ¹	Number of Occurrences ²	Status ³ State/USFWS/ CNPS
RED BANK	fairy candelabra (<i>Androsace elongata</i> ssp. acuta)	1	- / - / List 4
	dimorphic snapdragon (<i>Antirrhinum subcordatum</i>)	23*	- / -- / 1B
	Jepson's milkvetch (<i>Astragalus rattanii</i> var. <i>jepsonianus</i>)	8*	- / -- / 1B
	Stony Creek spurge (<i>Chamaesyce ocellata</i> ssp. <i>rattanii</i>)	9	- / -- / List 4
	Brandege's eriastrum (<i>Eriastrum brandegeae</i>)	3*	- / SC / 1B
	adobe lily (<i>Fritillaria pluriflora</i>)	5*	- / SC / 1B
	woolly meadowfoam (<i>Limnanthes floccosa</i> ssp. <i>floccosa</i>)	1	- / -- / List 4
	Jepson's navarretia (<i>Navarretia jepsonii</i>)	8	- / - / List 4
	Tehama navarretia (<i>Navarretia heterandra</i>)	11	- / -- / List 4
	sickle-fruit jewel-flower (<i>Streptanthus drepanoides</i>)	4	-- / - / List 4
THOMES-NEWVILLE	fairy candelabra (<i>Androsace elongata</i> ssp. acuta)	13	- / - / List 4
	dimorphic snapdragon (<i>Antirrhinum subcordatum</i>)	7*	- / -- / 1B
	Jepson's milk-vetch (<i>Astragalus rattanii</i> var. <i>jepsonianus</i>)	1*	- / -- / 1B
	Stony Creek spurge (<i>Chamaesyce ocellata</i> ssp. <i>rattanii</i>)	7	- / -- / List 4
	adobe lily (<i>Fritillaria pluriflora</i>)	12*	- / SC / 1B
	hogwallow evax (<i>Hesperevax caulescens</i>)	4	- / -- / List 4
	Tehama dwarf flax (<i>Hesperolinon tehamense</i>)	2*	- / SC / 1B
	N. California black walnut (<i>Juglans californica</i> var. <i>hindsii</i>)	1*	- / SC / 1B
	Tehama navarretia (<i>Navarretia heterandra</i>)	7	- / -- / List 4
SITES	fairy candelabra (<i>Androsace elongata</i> ssp. acuta)	3	- / - / List 4
	hogwallow evax (<i>Hesperevax caulescens</i>)	3	- / -- / List 4
	hoary navarretia (<i>Navarretia eriocephala</i>)	1	- / -- / List 4
	Tehama navarretia (<i>Navarretia heterandra</i>)	3	- / -- / List 4
COLUSA CELL	fairy candelabra (<i>Androsace elongata</i> ssp. acuta)	2	- / - / List 4
	hogwallow evax (<i>Hesperevax caulescens</i>)	2	- / -- / List 4
	hoary navarretia (<i>Navarretia eriocephala</i>)	1	- / -- / List 4
	Tehama navarretia (<i>Navarretia heterandra</i>)	1	- / -- / List 4

Notes: ¹ Nomenclature corresponds to Skinner and Pavlik 1994. ² Occurrences are defined under CNPS 1999 guidelines as population findings separated by at least 0.25 miles; * = DWR Priority species. ³ USFWS 1998: SC (Species of Concern); Skinner and Pavlik 1994; CNPS 1B; (Plants rare, threatened, or endangered in California and elsewhere); CNPS List 4 (Plants of limited distribution).

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Table 2.2.2. Diversity of Vascular Plant Families, Genera, and Species by Reservoir, and Native and Non-native Species.

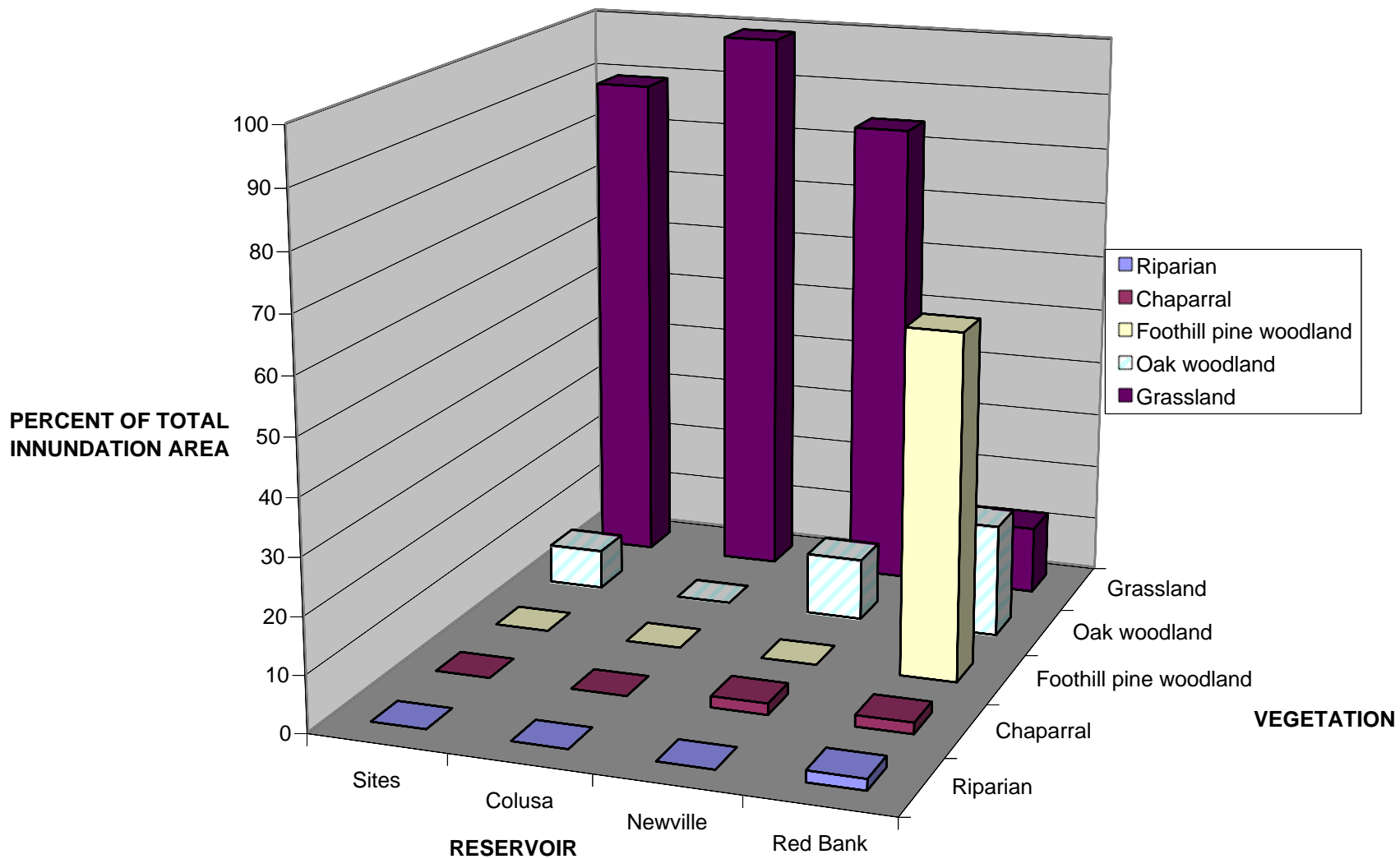
VASCULAR PLANT DIVERSITY	Sites	Colusa Cell	Thomes/ Newville	Red Bank
Number of families	62	58	85	76
Number of genera	219	193	259	229
Number of species	363	287	522	456
Native species	254	210	398	358
Nonnative species	109	77	124	98

2.2.4. Documentation Maps were prepared of the estimated survey coverage area and the level of survey effort (Figure 2.2.a-d). An inventory of identified vascular plants, including prioritized species, was compiled (Attachment 5). In addition, a plant voucher collection list was compiled for plants which were identified from preserved specimens (Attachment 6). Vouchers were placed in a preserved DWR collection. One hundred and forty-three prioritized species population records were documented in the project areas (Attachment 7). Color photographs were taken of prioritized species, their habitat, and plant communities in the reservoir sites (Attachment 8).

2.3. DISCUSSION

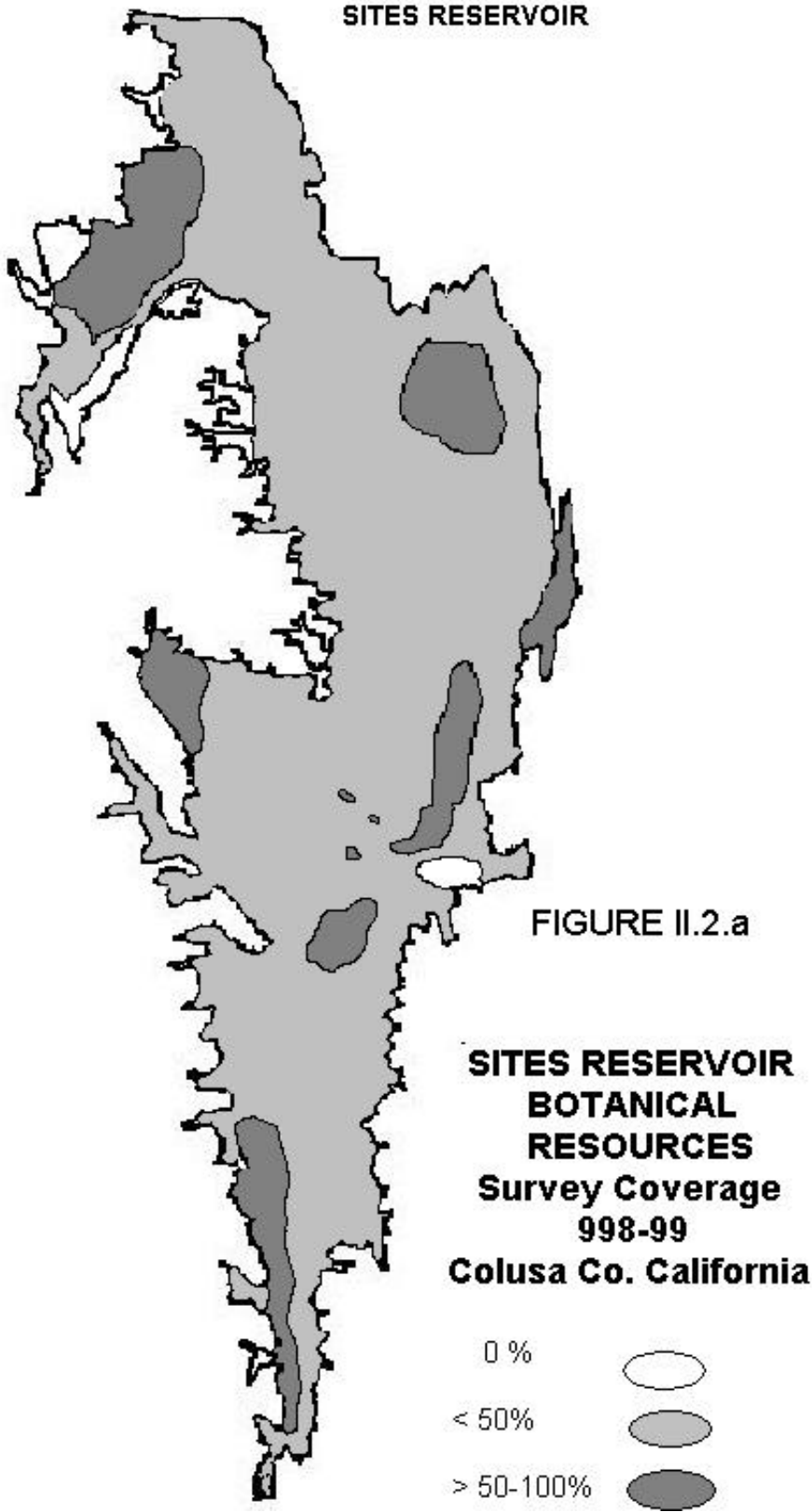
Percent cover calculations from the aerial photographs and the plant community profile show that annual grassland is the dominant plant community in the Sites, Colusa cell, and Newville reservoir areas (Figure 2.1; attachment 4.a-e). Grassland vegetation at these sites is 89, 99, and 84 percent of the total cover, respectively. Microhabitats within these annual grasslands support unique native annual plant species; these are northern clay hardpan vernal pools, swales, and seasonal wetlands. While the annual grasslands are highly variable with respect to species composition, the dominant species are European forage grasses,

**Figure II.1 OFFSTREAM STORAGE RESERVOIR INVESTIGATION:
Percent Dominant Vegetation by Reservoir Site**



OFFSTREAM STORAGE RESERVOIR INVESTIGATION

SITES RESERVOIR



**OFFSTREAM STORAGE RESERVOIR INVESTIGATION
COLUSA CELL RESERVOIR**

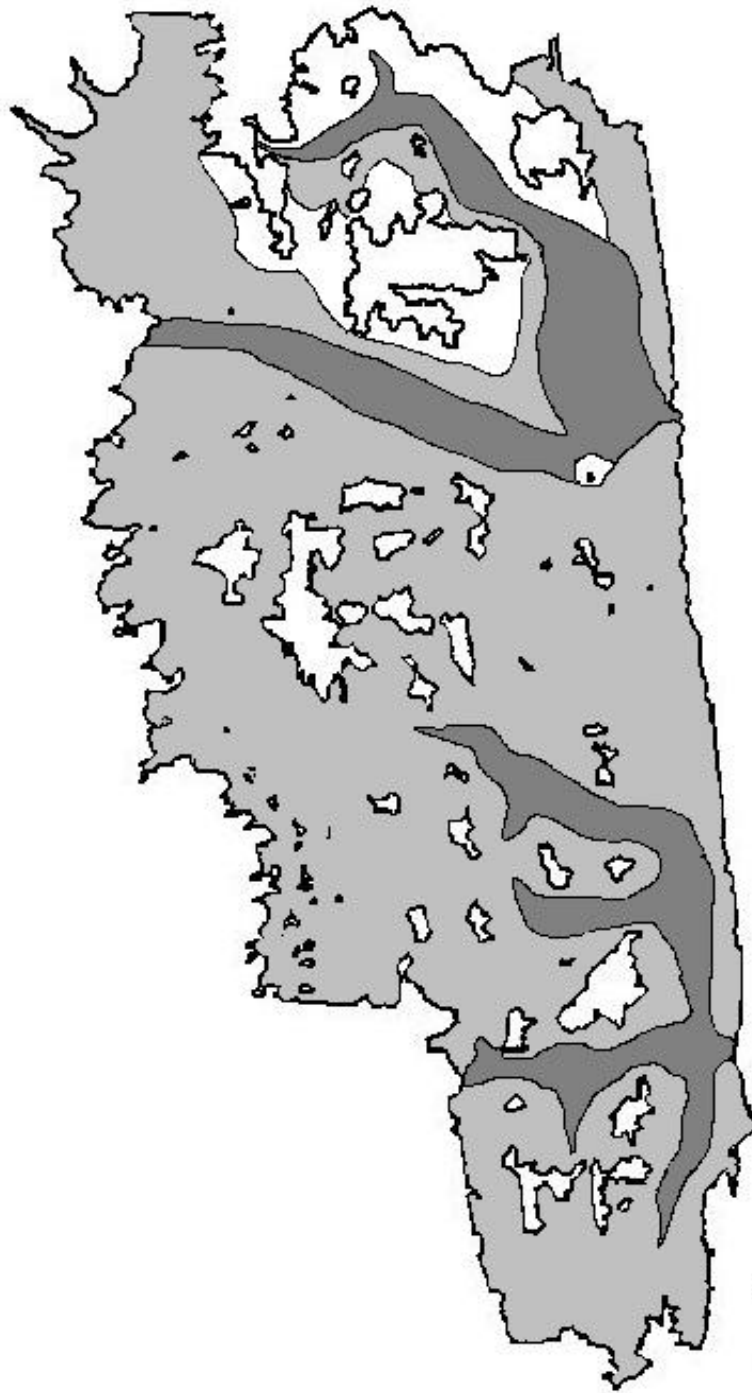


FIGURE II.2.b

**BOTANICAL RESOURCES
SURVEY COVERAGE
1998-99
Colusa & Glenn Co. California**

0%



<50%



50-100%



OFFSTREAM STORAGE RESERVOIR INVESTIGATION

NEWVILLE RESERVOIR

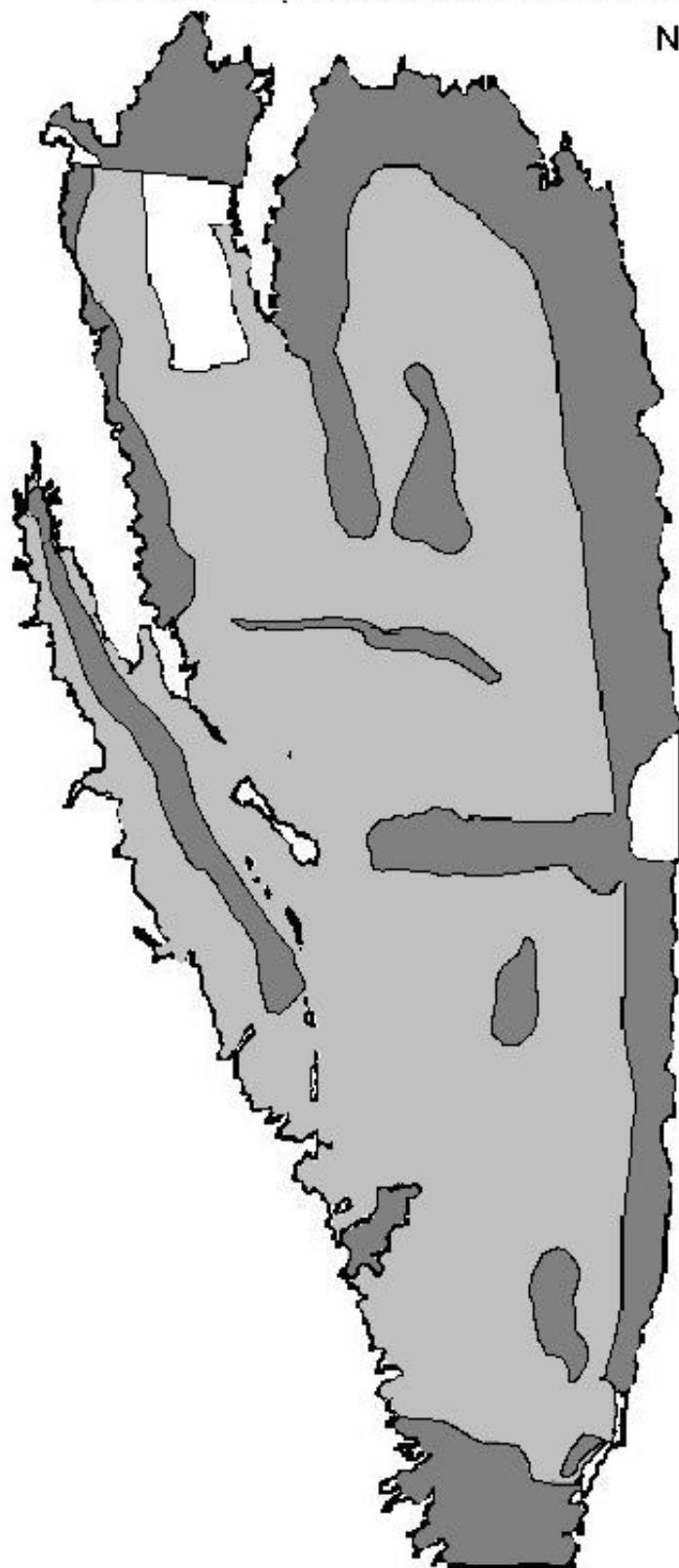


FIGURE II.2.c

BOTANICAL RESOURCES SURVEY COVERAGE 1998-99 Glenn & Tehama Co.

0 %



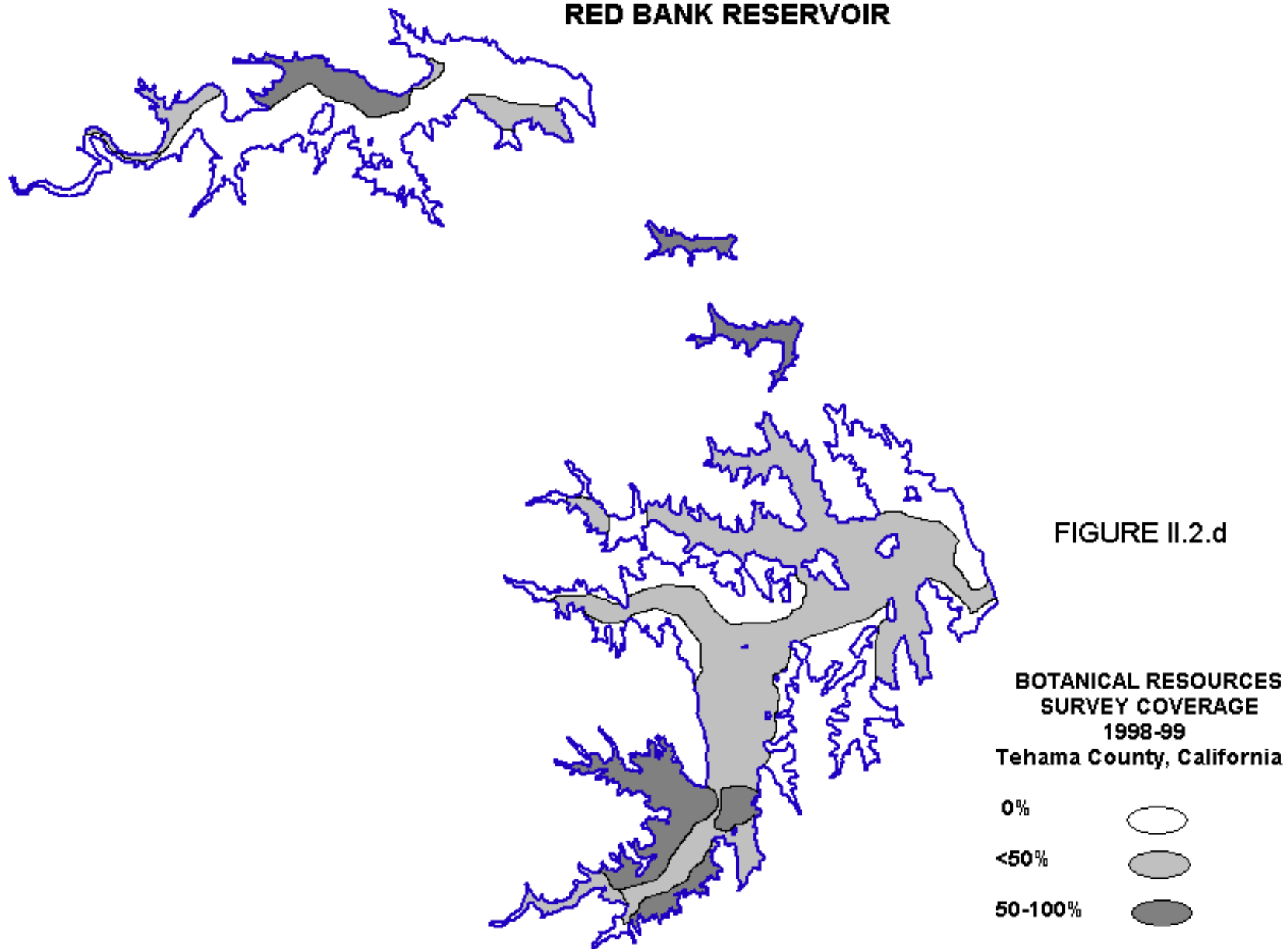
<50%



50-100%



**OFFSTREAM STORAGE RESERVOIR INVESTIGATION
RED BANK RESERVOIR**



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such as Italian ryegrass (*Lolium* sp.), wild oats (*Avena* sp.), and the forb, yellow star thistle (*Centaurea solstitialis*).

2.3.1. Sites and Colusa Cell Reservoirs Sites and the Colusa cell receive less average annual rainfall than Newville and Red Bank, and have a predominance of annual grassland vegetation that is managed for high intensity cattle grazing. Less than 10 percent of the vegetation in these reservoirs is woodland (*Quercus* sp. or *Pinus sabiniana*), chaparral, riparian, or vegetated wetland (*Eleocharis* sp.). Only six percent (923 acres) of the total inundation area of the Sites Reservoir supports oak woodland. Some of the oak woodland includes scattered low density stands of valley oak (*Quercus lobata*) on high terrace floodplains adjacent to Funks, Grapevine, and Antelope Creeks. There are few seedlings and saplings in the existing valley oak stands, which consist of large mature and senescent trees. The blue oak stands, however, have a diverse age class representation. Oak age classes were not measured. Nine-hundred twenty-three acres of oak woodland would be lost at Sites, and 20 acres would be lost at the Colusa cell reservoir.

The Sites reservoir area and Colusa cell do not have shale soil or potential habitat for the plants associated with this soil type. However, approximately 65 percent (8,916 acres) of Sites inundation area is clay soils, and the Colusa cell is approximately 36 percent (4,950 acres) clay substrate. Three of the four prioritized plants species found in the reservoirs were on clay soil.

Approximately 5 acres of vernal pools occur in the Sites reservoir. Three acres of vernal pools occur in the Colusa cell. Although six of the potential high priority species are vernal pool endemics, the probability of finding them is low because of the existing land use conditions. Clay hardpan vernal pools and alkaline wetlands were variable in quality and species composition. Although several pools in the Sites reservoir support common vernal pool species, all of the vernal pools were grazed and no prioritized species were observed. The majority of the mapped clay substrates

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support non-native annual vegetation.

Potential habitat for high priority and priority species exists in Sites and Colusa cell reservoirs, however, current management practices may not be compatible with supporting the prioritized species. Potential habitat includes vernal pools, swales and alkali wetlands, and valley and foothill grassland.

2.3.2. Newville Reservoir This site receives more average annual rainfall than the Sites and Colusa cell alternatives and has greater inherent topographic variability and soil conditions compatible with suitable habitat for priority and low priority species. The diversity of the vegetation communities, as well as clay and shale substrates at Newville, resulted in an increase in the total number of species and occurrences of prioritized species. Annual grassland, blue oak woodland (*Quercus douglasii*), valley oak woodland (*Quercus lobata*), mixed willow riparian (*Salix* spp.), and chaparral communities occur in the site.

Newville reservoir site supports valley and blue oak woodland vegetation over 11 percent (1,839 acres) of the inundation area. The valley oak stands are primarily along Upper Stony Creek at this site. The existing oak woodlands do not appear to be as heavily grazed as the Sites and Colusa cell woodlands. There are oak seedling and juvenile age classes in some areas, although this parameter was not quantified.

This reservoir supports more populations of priority and low priority species than Sites, Colusa cell, or Red Bank alternatives. It should be noted that the current land use practices are compatible with and sustain these prioritized plant populations. Roughly 7,000 acres of Lodo shale soil was mapped in this reservoir, but not all of this was potential habitat for the associated species. North and south-facing slopes, chaparral vegetation, and slopes with less than 50 percent vegetative cover were some of the other necessary parameters to support the shale-associated species. Although over 2,000 acres of clay soil were mapped, the observed prioritized species populations tended to occur only on the moderate north-facing slopes or flats. All clay and Lodo

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shale soils were adequately surveyed.

Vernal pools and alkaline wetlands in the Newville reservoir area were variable in quality, ranging from 0 to 100 percent cover and moderate to extreme grazing effect. Twenty-three acres of vernal pools were mapped in the inundation zone. There were good quality vernal pools with representation of common vernal pool flora; however, all the pools were grazed. No high priority species were found in any of the vernal pool habitat.

2.3.3. Red Bank Reservoir

The 4,600 acre Red Bank project area is dominated by native blue oak (*Quercus douglasii*), mixed oak (*Quercus* spp.), and foothill pine (*Pinus sabiniana*). Although oak woodlands represent approximately 20 percent (899 acres) of the project area, the total amount of woodland habitat including foothill pine woodland comprises 83 percent of vegetative cover. At this site, only 2 percent of the cover is chaparral scrub, and 12 percent (565 acres) is annual grassland. The grassland vegetation occurs on the high terrace floodplain of Red Bank Creek, and on several low hills (Attachment 4). Occasional native bunch grass (*Nassella* spp.) stands occur on moderate slopes under blue oak woodland.

The Red Bank alternative receives the most annual rainfall of the reservoir sites, has the most variable topography and vegetation, and moderate to light cattle grazing influence.

Several prioritized species were found on clay and Lodo shale soil. The 3,101 acres of mapped Lodo shale soil (67 percent) was not all potential habitat for the associated sensitive plant species. Prioritized species were found with additional microsite parameters, such as north- or south-facing aspect, moderate slope, less than 50 percent vegetative cover, or chaparral plant associates. Much of the Lodo shale soil was not suitable habitat for the prioritized species because these other microsite conditions were lacking.

Approximately 305 acres of clay soil was mapped but only three populations of a

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clay-associated priority species were found. The Lodo shale and clay soil areas were adequately surveyed except where no access was allowed or where terrain or vegetation made it infeasible.

Potential habitat exists at this site for the chaparral, valley and foothill woodland, and valley and foothill grassland prioritized species. There was no vernal pool or alkaline wetland habitat observed in the Red Bank reservoir site.

2.3.4. Future Needs

Surveys will be needed in each reservoir alternative where property access was not allowed in 1998 and 1999. Secondary effect areas, or areas just around the reservoirs, which may experience environmental impacts related to the reservoir projects include power lines, road realignments, conveyance facilities, recreation areas, or mitigation lands. These areas will require rare plant and inventory surveys and vegetation community mapping. Continued surveys of vernal pools, swales, and alkaline wetlands in the reservoir inundation zones are recommended by CDFG if property access allows (Lis 1999; Horenstein 1999).

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